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ABSTRACT

This research project investigated a collaborative effort between a university teacher education program and a public junior high school in a program to integrate technology into the school curriculum. The university-public school partnership defined inquiry and professional development as two of its primary functions. Several lesson plans were created and implemented by the teachers. Transcribed interviews, journals, and logs were coded as to their connection to eight elements of educational change: (1) "you can't mandate what matters"; (2) change is a journey not a blueprint; (3) conflict is essential; (4) vision and strategic planning come later; (5) individualism and collectivism must have equal power; (6) neither centralization nor decentralization works; (7) connection with the wider environment is critical; and (8) every person is a change agent. By making technology a construction tool in curriculum development, teachers were able to see quick results and impact in their classrooms. Teachers worked on the same software and supported each other in the learning curve. Both students and teachers enjoyed experimenting with the technology. As the program progressed, conversations moved from the mechanics of designing and implementing technology in the classroom to issues of learning and teaching, school renewal, and professional development. (AEF).

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Technology Inservice: A Powerful Change Force

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Technology Inservice: A Powerful Change Force

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Introducing technology into schools is a significant challenge because it requires change in curriculum and teacher practice. The Office of Technology Assessment (1995) concludes that for computer technology to become an integrated part of schools a high-quality preparation of staff is needed. Rutherford and Grana (1995) suggest that resistance to change is caused by an array of faculty fears. Included in these are "fear of change, fear of time commitment, fear of appearing incompetent, fear of techno lingo, fear of techno failure, fear of not knowing where to start, fear of being married to bad choices, fear of having to move backward to go forward, fear of rejection or reprisals" (p. 512). Several studies (Strudler, Quinn, McKinney, & Jones, 1995; Willis, Willis, Austin, & Colón, 1995; Roberts & Ferris, 1994) show that one of the problems with integrating technology into any curricula is the teacher in the classroom. There are a number of reasons for this, such as computer illiteracy, computer phobia, disinterest, lack of equipment, and lack of support personnel. Rapid technology changes make it difficult for faculty to stay current and using technology is frustrating. In addition, using technology is risky and faculty find it hard to take risks.

Teacher inservice can help teachers overcome computer illiteracy and phobia, but may not always help teachers integrate computers into their curriculum. Inservice programs that include full-time, site-based training that focuses on the individual needs of the teachers have a better chance of achieving the desired change of technology and curriculum integration (Pappillion & Cellitti, 1996). The changes teachers must make take time and must reflect the concerns teachers have about technology and the curriculum.

This paper reports on a collaborative effort between a university teacher education program and a public junior high school in a program to integrate technology into the school curriculum. The focus is to document how this collaborative effort reflects Michael Fullan's (1993) eight basic elements of change in the schools. In his study of educational change, Michael Fullan (1993) concludes that "change is a journey of unknown destination, where problems are our friends, where seeking assistance is a sign of strength, where simultaneous top-down and bottom-up initiative merge, where collegiality and individualism coexist in productive tension." (p. viii). He describes change as a move of educational systems toward learning environments where change is a part of daily work, not the latest policy decision:

- You can't mandate what matters. The more complex the change the less you can force it.
- Change is a journey not a blueprint. Change is nonlinear, loaded with uncertainty and excitement and sometimes perverse.
- Problems are our friends or conflict is essential. Problems are inevitable and you can't learn without them.
- Vision and strategic planning come later. Premature visions and planning blind.
- Individualism and collectivism must have equal power. There are no one-sided solutions to isolation and groupthink.
- Neither centralization nor decentralization works. Both top-down and bottom-up strategies are necessary.
- Connection with the wider environment is critical for success. The best organizations learn externally as well as internally.
- Every person is a change agent. Change is too important to leave to the expert, personal mind set and mastery is the ultimate protection. (p. 21-22)

Research Design

The focus of this research project was to investigate an inservice program aimed at developing curriculum that integrates technology into instruction that includes the problem-solving process. The university-public school partnership had defined inquiry and professional development as two of its primary functions. The two partners were jointly committed to helping teachers develop new curriculum that integrated technology (O'Neil, 1992; Broughy, 1992). Participants had discussed the importance of defining problems for students to solve as a part of the inquiry process and that the problems needed to be authentic and real-world in nature. Learning had been

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discussed as an on-going process of construction, generation, and creation of meaning enhanced by interaction with other learners in cooperative and interdependent efforts. The design was based on one similar to that reported by Solís (1997).

An earlier project began in a school with only one teacher being mentored by a university professor. The professor spent time helping a classroom teacher learn to use computer programs that were available at the school. The teachers and students were introduced to a spreadsheet program as a tool in data collection and analysis problems. The students were then placed in groups of four and asked to design and complete a problem that would require the collection and analysis of data. The professor worked with both the students and the teacher to select the problem and analyze the data (Wentworth, 1996).

As the program expanded to the whole school, teachers began to think about curriculum that could be enhanced with technology. Participants worked with software that enabled them to integrate technology into their curriculum with minimal acquisition of new skills. Initial work began in group sessions with teachers from one or two disciplines and moved to the classroom when the teachers had planned instruction that needed technology support. The teachers were encouraged to move at their own pace as they used the technology in their classrooms. Reflection and evaluation was an on-going process to keep the project on course, given the increased numbers of persons involved. The approach was similar to the one proposed by Resnick (1996) in his proposal of distributed constructionism. Their worked was shared with others in the group and with their students. In the process of sharing and teaching, participants rethought their work and learned from each other.

The professor, as part of a larger program of teacher education, was also involved in the supervision of student teachers in this particular school. The teacher education program was changing this same year to include university course work for the student teachers to be done at the school. The professor spent at least two full days a week in the school working with student teachers and with classroom teachers on the development of their integrated curriculum. Having the student teachers in some of the classrooms allowed some teachers freedom to develop lesson ideas and help in the computer lab with other teachers who did not have student teachers in their classrooms. Along with the integration of technology in the classroom, the teachers were placed in teams to integrate across subject areas. As teachers produced lessons that integrated in this way, they provided them to the district.

Several lesson plans were created and implemented by the teachers. Two examples are listed here:

1. You were very interested in the weight lifting at the Atlanta Olympics. You thought about the size and weight of the participants and the amount of weight they lifted. How would you determine which weight class lifted the highest weight as compared with their body size? Which person would you declare as the "strongest man on earth" based on this?
2. You are interested in how the Olympic games will effect the area of Salt Lake City in the year 2002. What areas of change do you expect to find? What data will you collect before the games? What data will you collect after the games? What predictions will you make based on the information you can collect about the Olympic games in Atlanta?

Question 1 integrates both mathematics and physical education. Question 2 integrates social studies and mathematics. Teachers collected data on these questions and then began to define questions for their students as examples. As the teachers implemented these in their classrooms, the students began to ask their own questions. The teachers were excited to see students engaging in inquiry in this way.

The researcher, the teachers, and students kept research logs of the projects from conception through final report. The researcher kept an account of the types of problems designed by the teachers, the discussion about the data required to answer the question, the use of technology to solve the problem, and the final analysis and representation of the data. Throughout the project, the researcher interviewed the teacher and students about their work, asking questions to get at their problem solving and their views about the use of technology as part of the problem-solving process: how did they select the data to collect, how did the technology aid in the analysis of the data, what conclusions were drawn from the results. The researcher also kept a journal of frustrations and successes experienced by the teachers and students.

Results

The data collection and data reduction techniques were based on methods perhaps most specifically discussed by Miles and Huberman (1984). The transcribed interviews, journals, and logs were coded as to their connection to Fullan's eight elements of change.

You Can't Mandate What Matters

Some teachers were unwilling to participate in the project because it was not required by the district or principal. However, once the initial inservice took place most teachers were excited to begin designing curriculum that would include the technology they had seen. Eighty-seven percent of the teachers in the school participated in the inservice group sessions; 95% of those teachers designed curriculum that integrated technology. Only 38% of

those teachers actually implemented the lesson with students. Many of the others said they planned to try it the next year when they could plan for it more easily.

Change is a Journey not a Blueprint

The university professor and the school teacher had learned from their experience of the first year that defining the problem presented to the students was a key element to successful integration projects. They did not impose their experience on teachers but encouraged them to think of specific questions to ask their students. The method for using technology was not dictated but suggested to the teachers.

Problems are Our Friends

Four months into the school year, the software was still not available, and the school learned that it was not to be donated, but would need to be purchased. Software was not licensed on all machines initially so work could not begin as early as had been hoped. The new computer lab was not wired on schedule, which also delayed the inservice. The only good that came from this is that there was time to become familiar with teachers in their classroom, what their expectations were for technology, and to problem solve. However, the fact that many teachers did not have time to implement their lessons was a direct result of this problem. Many of the teachers did implement technology the next year with perhaps more help from each other and less from the university specialist. The benefit here was that teachers learned to share ideas and expertise and not depend on an outsider for help.

Vision and Strategic Planning Come Later

Curriculum that includes technology was seen as an on going process that would develop over time. It was felt that more complete integration would come after teachers had become familiar with the software and exposure to inquiry learning. After the work with one teacher, then with one faculty, a vision for this type of inservice began to develop. The university professor and the teachers worked to think through the vision.

Individualism and Collectivism must have Equal power

"One of the things I've liked about this is that [the university professor] has not told us everything to do," said one participant. "I was able to plan things for my classroom the way I wanted them and then she tried to help me make them work for what she was doing." Teachers were learning from each other things they planned for their classrooms. The collective concern was that technology become a part of curriculum. The individual concern was that teachers be allowed to select lessons that were appropriate and interesting to them, not some larger agenda. These two concerns were given equal weight throughout the project.

Neither Centralization nor Decentralization Works

The school and the university shared in many discussions about design, implementation, and analysis of this project. No one group took away from the other. The university-public school partnership had been on going for several years and trust had been established between both organizations. Relationships had been built over a long period of time. Having a teacher at the school who had been through the process was a great benefit as well. She was able to help teachers when the professor was not at the school. She supported their ideas, and helped them prepare work that integrated content areas.

Connection with the Wider Environment is Critical for Success

Both the nature of collaboration among school departments, and the type of lessons designed by teachers indicate connections to the wider environment. The inservice was done with groups of teachers by departments that would naturally have similar content. Two examples of questions to ask students to begin the projects were about the Atlanta Olympics and the Olympics coming to the local community in 2002. Integration of content areas and local issues support the value of connecting to the wider environment.

Every Person is a Change Agent

"I can't believe how much help we've been to each other," commented one teacher. "Having us learn this, then help each other integrate it into the classroom has been great." When teachers take on the role of change agent, they share in the creation of the vision. They begin to believe that they are experts. They lose their fear of change.

Conclusions

By making technology a construction tool in curriculum development, teachers were able to see quick results and impact in their classrooms. This inservice program designed as a partnership between a public school teacher and a university instructor seemed to support Fullan's eight lessons of change. Very few comments and events were given just one code. "Problems are our friends" linked to the lesson that "change is a journey not a blueprint" the most often. Many problems occurred, but most of them were not considered "friends" by the participants, even when they did lead to additional inquiry and new understanding. "You can't mandate what matters" stood alone more often than other lessons. When it was linked to other lessons, the most common was "vision and strategic planning come later." "Individualism and collectivism must have equal power" and "neither centralization nor decentralization works" seemed to occur together. They were often linked to "connection with the wider environment is critical for success." "Every person is a change agent" paired with every other lesson to some extent. This lesson seemed to be central to the inquiry process.

Teachers worked on the same software and began together, so they supported each other in the learning curve. Teachers were able to consider integration of content area as they included technology in their curriculum. Having a university professor at the school helped the teachers initially try the technology. They worked together with the students to learn the software, and then determine how it could enhance the curriculum. As the year progressed, the professor spent less time teaching how to use the technology and began to help teachers rethink instruction and content. New types of problems were considered because the technology could help the student investigate and seek out answers.

Both students and teachers enjoyed experimenting with the technology. They worked together to define questions that had significance for the content of the curriculum. The questions were complex and interesting, requiring many days to complete. Teachers and students worked several days defining the problem and deciding on the data required to answer the question defined by the problem. Teachers and students felt like co-investigators and learners. The teachers began to feel confident in their abilities to use the technology. They began to trust the students to learn specific content as they defined their own problems.

As the program progressed, conversations moved from the mechanics of designing and implementing technology into the classroom to more substantive issues of learning and teaching, school renewal and professional development. Teacher renewal (inservice) was a natural outgrowth of learning and could lead to a new way of looking at professional development as a natural part of teaching and teacher education. This pilot has implications for a new way of thinking about professional development. It becomes an ongoing learning model instead of an inservice course taken after school, on Saturday, or during the summer months. The collaborative nature of the program can provide a road map as future programs continue to explore professional development through inquiry.

As new inservice programs at additional sights are begun, participants must remember Fullan's eight lessons of change. Visions and strategic planning must come from all the participants. New participants will have their personal concerns about what matters. Individual concerns must not be lost to collectivism. The participants will need to come together to negotiate their program, just as the participants in this program did. This pilot should not be used as a strict blueprint, but only as a road map to guide the journey. The university-public school partnership should continue to provide the necessary opportunities of such work to take place. The partnership should continue to evaluate the importance of collaborative learning through inquiry as a bases for school renewal and professional development.

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